What is claimed is:

1. A method for locating wireless mobile stations using wireless signal measurements of wireless signals transmitted between said wireless mobile stations and a network of base stations, wherein said base stations in the network are cooperatively linked for providing wireless communications with said wireless mobile stations, comprising:

providing a plurality of mobile station location estimators, wherein said location estimators provide location estimates of said mobile stations when said location estimators are supplied with location information derived from wireless signal measurements of wireless signals transmitted between said mobile stations and the network of base stations;

generating, by a first and a second of said location estimators, respectively, first and second different initial location estimates of a particular one of said wireless mobile stations, using location information derived from wireless signal measurements of wireless signals transmitted between said particular mobile station and the network of base stations;

determining:

(a) first confidence data for a first location hypothesis of said particular mobile station, wherein:

(i) said first location hypothesis provides one of: said first initial location estimate from said first location estimator, and a first successive location estimate of said particular mobile station, said first successive location estimate derived using said first initial location estimate, and

(ii) said first confidence data is indicative of a likelihood of said particular mobile station being at a location represented by said first location hypothesis; and

(b) second confidence data for a second location hypothesis of said particular mobile station, wherein:

(i) said second location hypothesis provides one of: said second initial location estimate from said second location estimator, and a second successive location estimate of said particular mobile station, said second successive location estimate derived using said second initial location estimate, and

(ii) said first confidence data is indicative of a likelihood of said particular mobile station being at a location represented by said first location hypothesis;

deriving a most likelihood location estimate of said particular mobile station, said most likely location estimate being dependent on each of: said location estimates of said first and second location hypotheses, and, values of said first and second confidence data.

2. A method as claimed in Claim 1, wherein said wireless signal measurements are from wireless signals communicated between said particular mobile station and said network of base stations using an identical communication standard as used when said network of base stations provide wireless communications with said particular mobile station for a purpose different from estimating a location of said particular mobile station.

3. A method as claimed in Claim 2, wherein said different purpose is one of: providing voice communication, and providing visual communication.

4. A method as claimed in Claim 2, wherein said communication standard is for one of CDMA and TDMA.

5. A method as claimed in Claim 1, wherein said wireless signal measurements are from wireless signals communicated between said particular mobile station and said network of base stations using an communication protocol for providing wireless voice communications between said network of base stations and said particular mobile station.

6. A method as claimed in Claim 1, wherein said wireless signal measurements of wireless signals communicated between said particular mobile station and said network of base stations are included in measurements capable of being determined for voice communication with said particular mobile station.

7. A method as claimed in Claim 1, wherein said wireless signal measurements include at least one of: (a) a measurement of a signal strength of wireless signals detected by said particular mobile station and transmitted by one of said base stations, and (b) a measurement of a signal time delay of wireless signals detected by said particular mobile station and transmitted by one of said base stations.

8. A method as claimed in Claim 1, wherein said step of providing includes:

transmitting through a telecommunications network, said first location estimator from a source site to a site having said second location estimator;

operably integrating said first location estimator with said second location estimator for performing said steps of determining and deriving.

9. A method as claimed in Claim 8, wherein said step of transmitting includes sending an encoding of said first location estimator using the Internet.

10. A method as claimed in Claim 1, wherein said step of determining includes retrieving historical location data related to said first initial location estimate and said second initial location estimate, wherein said historical location data includes:

(a1) location estimates by said first location estimator for some of said mobile stations at a first plurality of locations, and data identifying said locations of said first plurality of locations;

(b1) location estimates by said second location estimator for some of said mobile stations at a second plurality of locations, and data identifying said locations of said second plurality of locations;

wherein said first successive location estimate is determined using said historical location data of (a1), and said successive estimate is determined using said historical location data of (b1).

11. A method as claimed in Claim 1, wherein said step of determining includes first selecting a first set of one or more location estimates of said mobile stations also output by said first location estimator, wherein said one or more location estimates are determined according to, at least, a proximity of said one or more location estimates to said first initial location estimate.

12. A method as claimed in Claim 11, wherein said step of first selecting includes selecting said first set according to a function of a distance between said first initial location estimate and at least one of said location estimates of said first set.

13. A method as claimed in Claim 11, wherein each location estimate of said first set of location estimates has corresponding location data identifying a location of one of said mobile stations for which said location estimate estimates the mobile station's location, wherein the identified location has been verified.

14. A method as claimed in Claim 11, wherein said step of determining includes first obtaining a first collection of one or more previously identified locations, wherein each said previously identified location:

(a) has a corresponding location estimate in said first set, said corresponding location estimate being for a corresponding one of said plurality of mobile stations, and

(b) is approximately a location of the corresponding mobile station when said location information, derived from wireless signal measurements of transmissions between the corresponding mobile station and said network, was initially provided to said first location estimator for outputting said corresponding location estimate.

15. A method as claimed in Claim 14, wherein said step of determining includes first calculating said first successive location estimate of said particular mobile station from said first initial location estimate using said one or more previously identified locations.

16. A method as claimed in Claim 15, wherein said step of first calculating includes determining said first successive location estimate as a function of a convex hull of said one or more previously identified locations.

17. A method as claimed in Claim 15, wherein said step of determining includes first computing a first value of said first confidence data for said particular mobile station being at a location represented by said first successive location estimate, wherein said first value is a function of at least one of: (a) a value related to a density of said one or more previously identified locations for said first successive location estimate, and (b) a value related to a size of an area for said first successive location estimate.

18. A method as claimed in Claim 17, wherein for said second successive location estimate the following steps are performed:

(a) second selecting a second set of one or more location estimates of said mobile stations output by said second location estimator, wherein said location estimates of said second set are determined according to, at least, a proximity of said location estimates in said second set to said second initial location estimate;

(b) second obtaining a second collection of one or more previously identified locations, each said previously identified location: (i) having a corresponding location estimate in said second set for a corresponding one of said plurality of mobile stations, (ii) is approximately a location of the corresponding mobile station when said location information, derived from wireless signal measurements of transmissions between the corresponding mobile station and said network, was initially provided to said second location estimator for outputting said corresponding location estimate;

(c) second calculating said second successive estimate of said particular mobile station, wherein said second successive estimate is a function of said one or more previously known locations of said second collection; and

(d) second computing a second value of said second confidence data for said particular mobile station being at a location represented by said second successive location estimate, wherein said second value is a function of at least one of: (a) a value related to a density of said one or more previously identified locations of said second collection, and (b) a value related to a size of said second successive location estimate.

19. A method as claimed in Claim 11, wherein said first confidence data includes a data field for a value indicative of said particular mobile station being in an area, wherein said area is determined as a function of said first set of location estimates.

20. A method as claimed in Claim 1, wherein said first confidence data includes a data field for a value indicative of said particular mobile station not being in an area represented by said first location hypothesis.

21. A method as claimed in Claim 1, wherein said first and second initial location estimates are derived using location information obtained from a common collection of wireless signal measurements of wireless signals transmitted between said particular mobile station and the network of base stations.

22. A method as claimed in Claim 1, wherein said step of generating includes first computing said first initial location estimate using said location information obtained from a first collection of said wireless signal measurements, and second computing said second initial location estimate using said location information obtained from a second collection of said wireless signal measurements different from said first collection.

23. A method as claimed in Claim 22, wherein said first collection of said wireless signal measurements are for wireless signals transmitted between said particular mobile station and the network of base stations in a first time interval, and said second collection of said wireless signal measurements are for wireless signals transmitted between said particular mobile station and the network of base stations in a second time interval, wherein said first time interval precedes said second time interval.

24. A method as claimed in Claim 23, wherein said step of determining includes extrapolating said first successive location estimate using said first initial location estimate so that said first successive location estimate is expected to be for a time period approximately identical to said second time interval.

25. A method as claimed in Claim 1, further including:

performing a first simulation for predicting a likelihood of said particular mobile station being at a location represented by said first location hypothesis, wherein said simulation uses associated pairs of location representations, a first member of each pair including a location estimate obtained from said first location estimator and a second member of the pair including a representation of an actual location of one of said mobile stations for which said first member is a location estimate;

wherein said step of determining uses a result from said step of performing for determining said first confidence data.

26. A method as claimed in Claim 25, further including:

performing a second simulation for predicting a likelihood of said particular mobile station being at a location represented by said second location hypothesis, wherein said simulation uses associated pairs of location representations, a first member of each pair including a location estimate obtained from said second location estimator and a second member of the pair including a representation of an actual location of one of said mobile stations for which said first member is a location estimate;

wherein said step of determining uses a result from said step of performing for determining said second confidence data.

27. A method as claimed in Claim 25, wherein said first simulation is performed at a time outside of a time interval for performing the steps of generating, determining, and deriving.

28. A method as claimed in Claim 25, wherein said first simulation includes a statistical simulation.

29. A method as claimed in Claim 25, wherein said first simulation includes a Monte Carlo simulation.

30. A method as claimed in Claim 1, wherein at least said first and second location estimators each utilize a different one of the following:

(a) a pattern recognition location estimator for estimating a location of said particular mobile station by recognizing a pattern of characteristics of said location information;

(b) a trainable location estimator for estimating a location of said particular mobile station by training said trainable estimator to learn an association between each location of a plurality of geographical locations and corresponding instances of said location information related to the wireless signal measurements of wireless transmissions with one of said mobile stations at the location;

(c) a triangulation location estimator for estimating a location of said particular mobile station by triangulating on measurements of said location information, wherein said measurements are determined from the wireless signal measurements of wireless transmissions between said particular mobile station and at least three of the base stations of said network;

(d) a statistical location estimator for estimating a location of said particular mobile station by applying a statistical regression technique;

(e) a mobile base station estimator for estimating a location of said particular mobile station from location information received from a mobile base station detecting wireless transmissions of particular first mobile station;

(f) a coverage area location estimator for estimating a location of said particular mobile station by intersecting wireless coverage areas corresponding to each of a plurality of the base stations of said network;

(g) a negative logic location estimator for estimating where said particular mobile station is unlikely to be located.

31. A method as claimed in Claim 1, wherein at least said first location estimator includes one of the following:

(a) an artificial neural network for generating said first initial location estimate by training said artificial neural network to recognize a pattern of characteristics of said location information associated with a location from where said particular mobile station is transmitting;

(b) a distance estimator for generating said first initial location estimate by determining one or more distances between said particular mobile station and the base stations, wherein signal timing measurements, obtained from said wireless signal measurements of wireless transmissions between said particular mobile station and one or more base stations of said network, are used for determining said one or more distances;

(c) a statistical estimator for generating said first initial location estimate by applying to said location information one of the following statistical techniques: principle decomposition, least squares, partial least squares, and Bollenger Bands.

32. A method as claimed in Claim 31, wherein said second location estimator includes a different one of said artificial neural network, said distance estimator, and said statistical estimator for generating said second initial location estimate.

33. A method as claimed in Claim 318, wherein said distance estimator estimates the location of said particular mobile station by one of: a signal time of arrival and a signal time difference of arrival.

34. A method as claimed in Claim 1, wherein said first location estimator includes an artificial neural network, wherein said artificial neural network is one of: a multilayer perceptron, an adaptive resonance theory model, and radial basis function network.

35. A location system as claimed in Claim 1, wherein said first location estimator includes an artificial neural network with input neurons for receiving location information data related to wireless signal time delay measurements of signal strength for wireless transmissions between said particular mobile station and a first collection of base stations from said network.

36. A method as claimed in Claim 35, wherein for each base station in said first collection, said wireless transmissions between the base station and said particular mobile station are detected by one of: the base station and said particular mobile station.

37. A method as claimed in Claim 1, wherein said first estimator includes an artificial neural network with input neurons for receiving data related to wireless transmissions between said particular mobile station and a set of one or more of said base stations, wherein for each base station in said set, there is at least one said input neuron for receiving one or more values indicative of at least one of the following conditions:

(a) the base station is active for wireless communication with said particular mobile station and a pilot signal by the base station is detected by the particular mobile station;

(b) the base station is active for wireless communication with said particular mobile station and the base station detects wireless transmissions by said particular mobile station;

(c) the base station is active for wireless communication with said particular mobile station and the base station does not detect wireless transmissions by said particular mobile station;

(d) the base station is active for wireless communication with said particular mobile station and said particular mobile station does not detect wireless transmissions by the base station;

(e) the base station is not active for wireless communication with said particular mobile station.

38. A method as claimed in Claim 1, wherein said first and second location estimators are different artificial neural networks.

39. A method as claimed in Claim 38, wherein said first location estimator receives wireless signal time delay measurements of signal strength for wireless transmissions between said particular mobile station and a first collection of base stations from said network, and said second location estimator receives wireless signal time delay measurements of signal strength for wireless transmissions between said particular mobile station and a different second collection of base stations from said network wireless signal measurements.

40. A method as claimed in Claim 1, wherein said step of deriving includes combining values of said first and second confidence data when said first and second location hypotheses have location estimates of said particular mobile station that overlap.

41. A method as claimed in Claim 1, wherein said step of deriving includes combining the values related to: (a) a first likelihood measurement, of said first confidence data, for said particular mobile station being at a location represented by the first location hypothesis, and (b) a second likelihood measurement, of said second confidence data, for said particular mobile station being at a location represented by the second location hypothesis.

42. A method as claimed in Claim 41, wherein said step of deriving includes:

determining one or more subareas of a wireless coverage area containing location estimates of said first and second location hypotheses;

determining, when said first and second location hypotheses have location estimates that overlap in a first of said subareas, a third likelihood measurement for substantially all of said first subarea, wherein said third likelihood measurement is a function of said first and second likelihood measurements.

43. A method as claimed in Claim 42, wherein said function includes an addition of terms having said first and second likelihood measurements.

44. A method as claimed in Claim 1, wherein said step of deriving includes 0, of said first confidence data, for said particular mobile station being at a location represented by the first location hypothesis;

wherein said step of fuzzifying performs a function for distributing a decreased value of said first likelihood measurement to locations outside of a location estimate for said first location hypothesis.

45. A method as claimed in Claim 44, wherein said function includes a sigmoid term.

46. A method as claimed in Claim 1, further including an expert system for activating said first location estimator for outputting said first initial location estimate.

47. A method as claimed in Claim 46, wherein said first location estimator is activated by one of: an antecedent of an expert system rule, and a consequent of an expert system rule.

48. A method as claimed in Claim 1, further including a step of determining whether to modify one of: said first location hypothesis, and said first confidence data according to at least one of:

(a) an expected maximum velocity of said first mobile station;

(b) an expected maximum acceleration of said first mobile station;

(c) a predicted location of said first mobile station;

(d) an expected wireless signal characteristic of an area containing said first location hypothesis; and

(e) an expected vehicle route.

49. A method as claimed in Claim 48, wherein said step of determining whether to modify includes activating one of an expert system, a fuzzy rule inferencing system and a blackboard daemon.

50. A method as claimed in Claim 1, further including a step of storing historical mobile station location data for access during said step of determining, wherein said step of storing includes the following substeps:

(a) storing, for each location of a plurality of mobile station locations, a corresponding collection of wireless signal measurements of wireless signals transmitted between one of said mobile stations and the base stations of said network, wherein said one mobile station resides substantially at said location when said wireless signals are transmitted;

(b) storing, for each location of said plurality of mobile station locations, a corresponding set of location estimates, wherein for each of said mobile station location estimators and each said set of location estimates, there is a location estimate of said set that is generated by said mobile station location estimator; and

(b) storing, for each of said stored location estimates, corresponding identification data for identifying a corresponding particular one of said locations of said plurality of mobile station locations, wherein said corresponding identification data accurately identifies said particular location.

51. A method as claimed in Claim 50, wherein for at least a first of said corresponding collections of wireless signal measurements, there is an associated confidence value used for indicating a consistency of the corresponding collection with other of said

corresponding collections whose corresponding particular locations are within a determined proximity to the corresponding particular location for said first corresponding collection.

52. A method as claimed in Claim 51 further including a step of changing said associated confidence value when there is a deviation between said first corresponding collection deviates and said other corresponding collections by more than predetermined amount, wherein said deviation is determined using a statistical measurement of deviation.

53. A method as claimed in Claim 52, wherein said statistical measurement of deviation includes a standard deviation measurement.

54. A method as claimed in Claim 52 further including a means for prohibiting said first corresponding collection from use in said step of determining when said associated confidence value is outside of a predetermined range.

55. A location system for receiving measurements of wireless signals transmitted between a plurality mobile stations and a network of base stations, wherein said base stations in the network are cooperatively linked for providing wireless communication, the improvement characterized by:

a plurality of different location estimators for estimating locations of said mobile stations, such that when said location estimators are supplied with said measurements of wireless signals transmitted between one of the mobile stations and said network of base stations, said location estimators output corresponding initial location estimates of a geographical location of said one mobile station;

an archive for storing a plurality of data item collections, wherein for each location of a plurality geographical locations, there is one of said data item collections having:

(a1) a representation of the geographical location,

(a2) a set of said wireless signal measurements corresponding to one of said mobile stations transmitting from approximately the geographical location

(a3) for each location estimator of said plurality of location estimators, a corresponding initial location estimate generated when said set of said wireless signal measurements is supplied to said location estimator;

a means for constructing, for each of said location estimators, corresponding prediction measurements indicative of an historical accuracy of said location estimator, wherein for each said prediction measurement, there is:

(b1) a corresponding selected group of said data item collections used in determining said prediction measurement,

(b2) a collection of mappings, wherein each said mapping is an association between: (i) one of said corresponding mobile station initial location estimates generated by said location estimator using said wireless measurements of one of said data item collections in said selected group, and (ii) the geographical location of the data item collection;

a means for determining, for an identified one of said mobile stations, a plurality of location hypotheses, wherein for each said location hypothesis:

(c1) said location hypothesis has a location estimate of said identified mobile station derived using at least one initial location estimate, wherein said initial location estimate is generated by one of said plurality of location

estimators, said one location estimator being supplied with signal measurements of wireless signal transmissions between said identified mobile station and said network of base stations,

(c2) said location hypothesis has a confidence value used for indicating a likelihood of said identified mobile station being at a location represented by said location estimate for said location hypothesis, wherein one of said prediction measurements is used in determining said confidence value;

a most likely mobile station location estimator for determining a most likely location estimate of said identified mobile station, said most likely location estimate being derived using location estimates and confidence values from location hypotheses of said plurality of said location hypotheses.

56. A method as claimed in Claim 55, wherein said measurements are for wireless signals transmitted in a wireless signal protocol for voice communication between said identified mobile station and said network of base stations.

57. A location system as claimed in Claim 55, wherein said means for constructing includes means for performing a mobile station location simulation using said stored data item collections for determining said prediction measurements.

58. A location system as claimed in Claim 55, wherein said means for determining includes a means for deriving the location estimate of one of said location hypotheses using a time series of location estimates for said identified mobile station.

59. A location system as claimed in Claim 55, further including:

a storage means for storing a population of representations for values of a collection of system parameters of said location system, wherein said parameters affect a performance of said location system in locating mobile stations;

an adaptive component for determining one or more of said representations whose values of said collection of system parameters enhance at least one of: a reliability and an accuracy of said location system in locating said mobile stations;

wherein said adaptive component uses said plurality of data item collections for providing, for each version of said location system determined by different ones of said representations:

(d1) wireless signal measurements from some of said data item collections as input to said version, and

(d2) for each of said data item collections used as input in (d1), said corresponding geographical location for comparing with the corresponding most likely location estimate location output by said version.

60. A location system as claimed in Claim 59, wherein said adaptive component includes a genetic algorithm embodiment.

61. A location system as claimed in Claim 55, wherein for at least a first and second of said plurality of location estimators, each of said first and second location estimators include one of the following:

(e1) an artificial neural network for use in generating said corresponding initial location estimates, wherein said artificial neural network is trained to recognize a pattern of characteristics of said signal measurements associated with a location from where one of said mobile stations is transmitting;

(e2) a distance estimator for use in generating said corresponding initial location estimates, wherein said distance estimator determines one or more distances between one of said mobile stations and the base stations, and wherein signal timing measurements, obtained from wireless transmissions between said one mobile station and one or more of the base stations, are used for determining said one or more distances;

(e3) a statistical estimator for use in generating said corresponding initial location estimates, wherein said statistical estimator utilizes a statistical regression technique for correlating characteristics of measurements of wireless signals transmitted between one of said mobile stations and the base stations with a location for said one mobile station.

62. A method for locating a mobile station by receiving wireless signal measurements of wireless signals transmitted between a plurality mobile stations and a network of base stations, wherein said base stations in the network are cooperatively linked for providing wireless communication, the improvement characterized by:

providing a mobile station location estimator for estimating locations of said mobile stations, such that when said location estimator is supplied with said measurements of wireless signals transmitted between one of the mobile stations and said network of base stations, said location estimator generates a initial location estimate of a geographical location of said one mobile station;

storing a plurality of data item collections, wherein for each of a plurality of geographical locations, there is one of said data item collections having: (a1) a representation of the geographical location, and (a2) a representation of measurements of wireless signals transmitted between one of said mobile stations and the base stations when said one mobile station is approximately at the geographical location;

determining, from said initial location estimate, a corresponding adjusted location estimate as a function of historical initial location estimates generated by said mobile station location estimator when supplied with said signal measurements for representations of (a2) of said data item collections.

63. A method as claimed in Claim 62, wherein said step of determining includes the steps of:

generating additional initial location estimates when said mobile station location estimator is supplied with said signal measurements for representations of (a2) for said data item collections;

selecting said additional initial location estimates that are within a determined distance of said initial location estimate; and

deriving said corresponding adjusted location estimate using said geographical location representations of (a1) for data item collections of a particular set of said data item collections, wherein said additional initial location estimates selected in said step of selecting were generated from said signal measurements for representations of (a2) for said data item collections of said particular set.

64. A method as claimed in Claim 62, wherein said geographical locations represented in (a1) of said data item collections have been verified.

65. A method as claimed in Claim 62, wherein for each data item collection in a set of at least some of said data item collections, there is an associated confidence value used for indicating a consistency of the representation of (a2) for said data item collection with the representation of (a2) for other of said data item collections whose geographical location representations (a1) are within a determined maximum distance of said geographical location representation of (a1) for said data item.

66. A method as claimed in Claim 65 further including:

a step of decreasing a confidence of a first data item collection in said set relative to a confidence for other of said data item collections of said set, when there is a deviation between the measurements of said representation (a2) for said data item collection,

and the measurements of said representations (a2) for said other data item collections, by more than predetermined amount, wherein said deviation is determined using a statistical measurement of deviation.

67. A method as claimed in Claim 66, wherein said step of decreasing includes comparing a time related measurement for said first data item collection with a value used for identifying said data item collections that have more recent representations (a2).

68. A method as claimed in Claim 66, wherein said step of decreasing includes computing said deviation by computing a statistical measurement of deviation.

69. A method as claimed in Claim 68, wherein said statistical measurement includes one of: a first, a second and a third order standard deviation.

70. A method as claimed in Claim 66 further including a step of prohibiting said first data item collection from being used in said step of determining, when said confidence for said first data item is outside of a predetermined range.

71. A method as claimed in Claim 62, wherein said mobile station location estimator activates an artificial neural network when generating said initial location estimate.

72. A location system for receiving wireless signal measurements of wireless signals transmitted between a plurality mobile stations and a network of base stations, wherein said base stations in the network are cooperatively linked for providing wireless communication, the improvement characterized by:

a one or more location estimators for estimating locations of said mobile stations, such that when said location estimators are supplied with said measurements of wireless signals transmitted between one of the mobile stations and said network of base stations, said one or more location estimators generate initial location estimates, wherein for a particular one of said mobile stations at a particular geographical location, at least first and second initial location estimates are generated;

a means for generating, for said first and second initial location estimates, first and second adjusted location estimates respectively, wherein:

(a1) said first adjusted location estimate has a corresponding confidence value indicative of a likelihood of the particular geographical location being at a location represented by the first adjusted location estimate,

(a2) said first adjusted location estimate is a function of other initial location estimates generated by said location estimator that generated said first initial location estimate,

(a3) said second adjusted location estimate has a corresponding confidence value indicative of a likelihood of the particular geographical location being at a location represented by the second adjusted location estimate, and

(a4) said second adjusted location estimate is a function of other initial location estimates generated by said location estimator that generated said second initial location estimate;

a most likely estimator for determining a most likely location estimate of the particular geographical location of the particular mobile station, said most likely location estimate being derived using said first and second adjusted location estimates and their corresponding confidence values.

73. A location system, as claimed in Claim 72 further including an archive for storing a plurality of data item collections for determining measurements related to a past performance of said corresponding location estimator generating said first initial

location estimate, wherein said measurements are used in for determining said corresponding confidence value for said first adjusted location estimate, wherein for each of a plurality geographical locations, there is a corresponding one of said data item collections having a representation of the geographical location and a representation of measurement of wireless signals transmitted between said particular mobile stations and the base stations.

74. A location system, as claimed in Claim 73, wherein said means for generating includes a means for constructing said measurements, wherein said measurements include values related to a predictiveness of a collection of mappings between: (a) a cluster of initial location estimates, determined by said corresponding location estimator, for one or more of the mobile stations at a plurality of geographical locations, and (b) a corresponding representation of an actual mobile station location for each of the initial location estimates in said cluster.

75. A location system, as claimed in Claim 74, wherein said cluster of initial location estimates are within a predetermined distance of said first initial location estimate.

76. A location system, as claimed in Claim 74, wherein said measurements are dependent on a density of said corresponding representations of actual mobile station locations for the initial location estimates in said cluster.

77. A location system, as claimed in Claim 74, wherein said measurements are dependent on a size of an area containing said mobile station locations of said corresponding representations of actual mobile station locations for the initial location estimates in said cluster.

78. A location system, as claimed in Claim 72, wherein said corresponding confidence value for said first adjusted location estimate indicates a likelihood of said particular mobile station being outside of an area for said first adjusted location estimate.

79. A location system, as claimed in Claim 72 further including a means for partitioning a wireless coverage area having said first and second adjusted location estimates into subareas, each subarea having expected similar measurements of wireless signals transmitted between one of said mobile stations in the subarea and the network of base stations.

80. A location system, as claimed in Claim 72, further including a means for partitioning a wireless coverage area into subareas, wherein each subarea has a corresponding area type characterized by wireless signal transmission characteristics between locations in said subarea and the base stations of said network.

81. A location system, as claimed in Claim 72, wherein said one or more mobile station location estimators include one or more of: a triangulation mobile station estimator, a trilateration mobile station estimator, a trainable mobile station estimator, a statistical mobile station estimator.

82. A location system, as claimed in Claim 81, wherein said triangulation mobile station estimator triangulates using one of: a signal time of arrival, and a signal strength between the associated mobile station and each of three of said base stations.

83. A location system for wireless mobile stations, as claimed in Claim 81, wherein said trilateration mobile station estimator trilaterates using a signal time difference of arrival between the associated mobile station and each of three of said base stations.

84. A location system, as claimed in Claim 81, wherein trainable mobile station estimator includes an artificial neural network.

85. A location system, as claimed in Claim 72, wherein said one or more location estimators receives input from a mobile base station.

86.2 A location system, as claimed in Claim 72, wherein said means for generating includes a simulation means for determining a predictiveness of said location estimator that generates said first initial location estimate.

87. A location system, as claimed in Claim 86, wherein said simulation means includes a statistical simulation for predicting said confidence value said first adjusted location estimate.

88. A location system for wireless mobile stations, as claimed in Claim 87, wherein said statistical simulation includes a Monte Carlo simulation.

89. A location system, as claimed in Claim 72, wherein, for deriving said most likely location estimate, said most likely estimator uses a probability density function for fuzzifying at least said confidence value for said first adjusted location estimate over an area outside of said first adjusted location estimate.

90. A location system, as claimed in Claim 72, wherein for a first collection of cells of a cell mesh for the wireless coverage area, said most likely estimator includes means for determining a likelihood that said particular mobile station is in each cell of said first collection.

91. A location system for wireless mobile stations, as claimed in Claim 90, wherein boundaries between cells said cell mesh are substantially coincident with boundaries of a wireless signal area type categorization.

92. A location system for receiving wireless signal measurements of wireless signals transmitted between a plurality mobile stations and a network of base stations, wherein said base stations in the network are cooperatively linked for providing wireless communication, the improvement characterized by:

an archive for storing a plurality of data item collections, wherein for each location of a plurality geographical locations, there is one of said data item collections having (a1) and (a2):

(a1) a representation of the geographical location,

(a2) a set of said wireless signal measurements corresponding to one of said mobile stations transmitting from approximately the geographical location

a trainable location estimator for generating a geographical location estimate of one of said mobile stations when said trainable estimator is supplied with said measurements of wireless signals transmitted between one of said mobile stations and the network of base stations, wherein said trainable location estimator learns by associating, for each of at least some of said data item collections, said geographical location representation (a1) of the data item collection with said set of said wireless signal measurements (a2) of the data item collection.

93. A location system, as claimed in Claim 92, wherein said trainable location estimator includes a pattern recognition component for recognizing patterns in said wireless signal measurements (a2) for data item collections in an area of a wireless coverage area, wherein said area is determined using said geographical location representations (a1) of said data item collections that have for each of their sets of said wireless signal measurements (a2), wireless signal measurements from a same group of said base stations.

94. A location system, as claimed in Claim 92, wherein said trainable location estimator includes an artificial neural network.

95. A method as claimed in Claim 94, further including a different trainable location estimator utilizing a different artificial neural network for generating a different geographical location estimate of said one mobile station.

96. A method as claimed in Claim 94, wherein said artificial neural is one of: a multilayer perceptron, an adaptive resonance theory model, and radial basis function network.

97. A location system as claimed in Claim 92, wherein said trainable location estimator utilizes an artificial neural network with input neurons for receiving wireless signal time delay measurements of signal strength as said measurements of wireless signal transmissions between said one mobile station and a first collection of base stations from said network.

98. A method as claimed in Claim 97, wherein for each base station in said first collection, said wireless transmissions between the base station and said one mobile station are detected by one of: the base station and said one mobile station.

99. A method as claimed in Claim 92, wherein said trainable location estimator utilizes an artificial neural network with input neurons for receiving data related to wireless transmissions between said one mobile station and a set of one or more of said base stations, wherein for each base station in said set, there is at least one said input neuron for receiving one or more values indicative of at least one of the following conditions:

(a) the base station is active for wireless communication with said one mobile station and a pilot signal by the base station is detected by the one mobile station;

(b) the base station is active for wireless communication with said one mobile station and the base station detects wireless transmissions by said one mobile station;

(c) the base station is active for wireless communication with said one mobile station and the base station does not detect wireless transmissions by said one mobile station;

(d) the base station is active for wireless communication with said one mobile station and said one mobile station does not detect wireless transmissions by the base station;

(e) the base station is not active for wireless communication with said one mobile station.

100. A location system, as claimed in Claim 92, wherein for at least some of said data item collections, each data item collection additionally includes at least some of the following:

(a) at least one of a make and model of a particular mobile station used in obtaining said representation of (a2);

(b) an identification of at least one of said base stations used in obtaining the representation of (a2);

(c) a value indicative of whether the representation of (a1) has been verified as an accurate geographical location estimate of the particular mobile station;

(de) a value indicative of how consistent the representation of (a2) is with the representations of (a2) for other of said data item collections;

(e) timestamp data indicative of approximately when the measurements of wireless signals for the representation of (a2) were received by one: the network and said location system;

(f) power level data related to one or more power levels of said at least one of said base stations used in obtaining said measurements for the representation of (a2) for the data item collection;

(g) power level data related to the power level of the particular mobile station when said wireless signals, for measurements of the representation of (a2) for the data item collection, were transmitted.

101. A location system for receiving wireless signal measurements of wireless signals transmitted between a plurality mobile stations and a network of base stations, wherein said base stations in the network are cooperatively linked for providing wireless communication, the improvement characterized by:

a plurality of mobile station location estimators for estimating locations of said mobile stations, such that when said location estimators are supplied with said measurements of wireless signals transmitted between one of the mobile stations and said network of base stations, said location estimators output corresponding initial location estimates of a geographical location of said one mobile station, wherein at least two of said mobile station location estimators of said plurality of mobile station location estimators include a different one of the following (a) through (f):

(a) a pattern recognition component for estimating a location of said one mobile station from a pattern in the wireless signal measurements of transmissions between the network and said one mobile station;

(b) a trainable mobile station location estimating component for estimating a location of said one mobile station, wherein said trainable mobile station location estimating component is capable of being trained to associate: (i) each location of a plurality of geographical locations with (ii) corresponding measurements of wireless signals transmitted between a specified one of said mobile stations and the network, wherein said specified mobile station is approximately at the location;

(c) a triangulation component for estimating a location of said one mobile station, wherein said triangulation component utilizes said measurements of wireless signals between said one mobile station and three of the base stations for triangulating a location estimate of said one mobile station;

(d) a statistical component utilizing a statistical regression technique for estimating a location of said one mobile station;

(e) a mobile base station component for estimating a location of said one mobile station, wherein said mobile base station component utilizes location information received from a mobile base station that detects said one mobile station;

(f) a negative logic component for estimating an area of where said one mobile station is unlikely to be located; and

a most likely estimator for determining a most likely location estimate of said one mobile station, said most likely location estimate being a function of said plurality of location estimates.

102. A location system, as claimed in Claim 101, wherein at least one of said mobile station location estimators is activated by an expert system.

103 A location system, as claimed in Claim 101, wherein one or more of said mobile station location estimators are capable of being at least one of: added, replaced and deleted by Internet transmissions between said location system and a site remote from location system.

104. A location system for receiving wireless signal measurements of wireless signals transmitted between a plurality mobile stations and a network of base stations, wherein said base stations in the network are cooperatively linked for providing wireless communication, the improvement characterized by:

a mobile station location providing means for estimating locations of said mobile stations, such that when said providing means is supplied with said measurements of wireless signals transmitted between a particular one of the mobile stations and said network of base stations, said providing means determines a first collection of one or more location estimates for said particular mobile station;

an expert system for activating expert system rules for one of: (a) modifying one of said location estimates of said first collection, and (b) obtaining additional location estimates of the particular location;

a most likely estimator for determining a most likely location estimate of the particular location, said most likely location estimate being a function of one or more location estimates provided by said expert system.

105. A location system, as claimed in Claim 104, wherein said expert system includes expert system rules for modifying a value indicating a confidence in said particular mobile station being at a location represented by one of said location estimates

106. A mobile location system for locating wireless mobile stations that communicate with a plurality of networked base stations, comprising:

a wireless transceiver means: (a) for at least detecting a direction of wireless signals transmitted from a wireless mobile station, and (b) for communicating with said networked base stations information related to a location of said wireless mobile station;

a means for detecting whether a detected wireless signal from said mobile station has been one of: reflected and deflected;

a means for estimating a location said mobile station by using wireless signals transmitted from said mobile station that are not detected by said means for detecting as one of: reflected and deflected.

107. A mobile location system as claimed in Claim 106, wherein said means for detecting includes a means for comparing: (a) a distance of said mobile station from said mobile location system using a signal strength of said wireless signals from said mobile station, and (b) a distance of said mobile station from said mobile location system using a signal time delay measurement of wireless signal from said mobile station.

108. A mobile location system as claimed in Claim 106, further including

one or more location estimators for estimating a location of said mobile location system, wherein said at least one of said location estimators uses wireless signals transmitted from one of: said networked base stations and a global positioning system.

109. A mobile location system as claimed in Claim 108, further including

a deadreckoning means for estimating a change in a location of said mobile location system, wherein said deadreckoning means provides incremental updates to said one or more location estimates of said mobile location system output by said at least one location estimator.

110. A mobile location system as claimed in Claim 106, wherein said wireless transceiver means includes one of a directional antenna and a sectored antenna.

111. A mobile location system as claimed in Claim 106, wherein said means for estimating includes a means for snapping an estimated location of said mobile station to a vehicle traffic route.

112. A method for locating a wireless mobile station, comprising:

determining one or more collections of one or more location hypotheses of a location of a particular mobile station, wherein, for each of said collections, said one or more location hypotheses of said collection are obtained using measurements of wireless signals transmitted between said particular mobile station and a network of base stations, wherein said wireless signals are transmitted during a time interval different from any other time interval for transmitting wireless signals whose measurements are used for obtaining said location hypotheses for a different one of said collections, and wherein each said location hypothesis of each said collection provides access to the following attributes:

(a) an estimate of the location of said particular mobile station,

(b) time related data for determining a measurement of time since the wireless signals, upon which said location estimate of the location hypothesis, were transmitted,

(c) a confidence providing a measurement of a likelihood that said particular mobile station is at a location represented by said location estimate attribute of said location hypothesis;

constructing one or more derived location hypotheses, wherein each said derived location hypothesis also has said attributes (a) through (c), and wherein at least one of said attributes, for each of said derived location hypotheses, is determined using said attributes of said location hypotheses of said collections;

estimating a location of said particular mobile station using said one or more derived location hypotheses.

113. A method as claimed in Claim 112, wherein said step of constructing includes deriving a value for said location estimate attribute of one of said derived location hypotheses by using said location estimate attributes of location hypotheses in said one or more collections.

114. A method as claimed in Claim 113, wherein said deriving includes extrapolating said location estimate of said one derived location hypothesis from said location estimate attributes of location hypotheses in said one or more collections.

115. A method as claimed in Claim 112, wherein said step of constructing includes inserting said location hypotheses of said collections into one of: an expert system fact base, and a blackboard run-time storage.

116. A method for locating a wireless mobile station, comprising:

providing at least a first location estimator for estimating locations of a plurality of wireless mobile stations, wherein said first location estimator receives as input wireless signal measurements of wireless signals transmitted between said plurality mobile stations and a network of base stations, wherein for said network, said base stations in the network are cooperatively linked for providing wireless communication;

storing a plurality of data item collections, wherein for each of a plurality locations, there is one of said data item collections having: (a) a representation of the location, and (b) said wireless signal measurements corresponding to one of said mobile stations transmitting from approximately the location;

activating said first location estimator with said wireless signal measurements of said data item collections for obtaining corresponding mobile station location estimates;

constructing a first set of said measurements for said first location estimator, wherein said first set includes values related to a predictiveness of a collection of mappings between: (a) said corresponding mobile station location estimates, and (b) for each said corresponding mobile station location estimate, a corresponding verified mobile station location;

generating, by said first location estimator, a first initial location estimate from wireless signal measurements of wireless signals from transmissions between a first of said mobile stations and the base stations, wherein a location of said first mobile station is unknown;

obtaining an adjusted location estimate of said first mobile station, wherein said adjusted location estimate is obtained by using a subcollection of said mappings in a neighborhood of said first initial location estimate;

determining a confidence value related to a likelihood of said first mobile station being at a location represented by said adjusted location estimate, wherein said confidence is a function of at least one measurement in said first set of measurements.

117. A method as claimed in Claim 116, wherein said step of constructing includes simulating locating one of said mobile stations using said corresponding mobile station location estimates and said corresponding verified mobile station locations.

118. A method as claimed in Claim 117, wherein said step of simulating includes performing a Monte Carlo simulation.

119. A method for locating wireless mobile stations from measurements of wireless signals transmitted between the mobile stations and a network of base stations, wherein for said network, said base stations in the network are cooperatively linked for providing wireless communication, comprising:

storing a plurality of data item collections, wherein for each of a plurality locations, there is one of said data item collections having: (a) a representation of the location, and (b) said wireless signal measurements corresponding to one of said mobile stations transmitting from approximately the location, wherein said wireless signal measurements are acceptable as input to a wireless mobile station location system;

determining a collection of parameters of said wireless mobile station location system that affect a performance of said wireless mobile station location system in locating mobile stations;

providing a population of representations for values of said collection of parameters to an adaptation component, wherein said adaptation component: (a) generates, for said representations, configurations of said wireless mobile station location system, each said configuration corresponding to the values of one of said representations, and (b) determines, for each of at least some of said configurations, a location predicting performance using said plurality of data items for providing wireless signal measurements as input and said representations of locations for comparing with mobile station location outputs by the configuration;

determining a first of said configurations that an enhanced performance of said wireless mobile station location system;

using said first configuration for deriving a location estimate of a first one said mobile station, wherein said first configuration is provides with wireless signal measurements of wireless signals from transmissions between said first mobile station and the base stations, and wherein a location of said first mobile station is unknown.

120. A method as claimed in Claim A9, wherein said adaptation component includes a genetic algorithm embodiment.

121. A method for locating a wireless mobile station, comprising:

determining a plurality of location estimates of a mobile station, wherein: (a) said plurality of location estimates are derived from wireless signal measurements of wireless signals transmitted between the mobile station and a network of base stations, wherein for said network, said base stations in the network are cooperatively linked for providing wireless communication, (b) said location estimates are time ordered;

obtaining an additional location estimate of said mobile station using additional wireless signal measurements transmitted between said mobile station and the network of base stations;

deriving at least one derived location estimate of said mobile station that is different from said plurality of location estimates, said derived location estimate obtained using one or more measurements of a behavior of said time ordered location estimates;

assigning a likelihood value that said mobile station is at location represented by said additional location estimate as a function of a distance between said additional location and said derived location estimate.

122. A method as claimed in Claim 121, wherein said measurements determine at least one of: a speed of said mobile station, a direction of said mobile station, a change in speed of said mobile station, and a change in direction of said mobile station.

123. A method as claimed in Claim 121 further including a step of assigning a likelihood value to said derived location estimate as a function of a characteristic of an environment of an area containing said plurality of location estimates, wherein said characteristic is expected to affect the behavior of said time ordered location estimates.

124. A method as claimed in Claim 123, wherein said characteristic is one of: a traffic route, a waterway, an abrupt change in elevation, a weather condition, a density of buildings having a predetermined height.

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